

Appl. No. 10/577,965
Proposed Amendment for Examiner's Interview

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Proposed Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) Electric motor (10) for adjusting moving parts in a motor vehicle, comprising an electronic unit (70) with a sandwich construction, which contains a first electrically conductive substrate (71) and a second electric conductive substrate (72), between which power components (75) are located and electrically connected to both substrates (71, 72), and a side (84) of the second substrate (72) facing away from the first substrate (71) is equipped with additional electronic components (56), wherein the first substrate (71) as a punched grid (44) punched from a metal material, which together with the second substrate (72) is extrusion coated with and encapsulated by a plastic body (95) produced by injection molding in such a way that extensions (97) of the punched grid (44) protrude from the plastic body (95), forming an electrical and/or mechanical interface (98) for connecting additional motor components (99, 38, 40, 104, 102, 80).
2. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the extensions (97) are bore holes (100) of the electronic unit (70).
3. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the extensions (97) are connector pins (88) or contact points (101) to external electronic components (74) and made of material containing copper.
4. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the motor components (99) are spring clips (40) for accommodating carbon brushes (38).
5. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the motor components (99) are electro-magnetic shielding bodies (104), which are formed as one piece with the extensions (97).

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6. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that holding elements (91) are formed on the punched grid (44), into which the power components (95) and/or the second substrate (72) can be inserted in order to produce an electrical and/or mechanical connection to the punched grid (44).
7. (Currently Amended) Electric motor (10) according to Claim 1, characterized in that the contact points (101) are interfaces (98) using nip-clinch technology.
8. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that a microprocessor (58) and/or a control logic (58) and a position sensory mechanism (60) for an armature shaft (12) of the electric motor (10) are arranged on the second substrate (72) as electronic components (56).
9. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the second substrate (72) has at least one electrically conductive surface (83, 84), and the electronic components (56) can be equipped variably by means of soldering or conductive adhesion, using flip-chip technology.
10. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the second substrate (72) has a ceramic plate (81) and at least one conductor track layer (83, 84) on its upper and lower sides, which are connected to one another electrically by means of via holes.
11. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the power components (75) and/or the components (56) are bare die elements without a housing.
12. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the power components (75) have a solderable or conductively adhesive surface (85, 86) on both sides, which is provided with solder bumps (90) for soldering technology on the side (86) facing the second substrate (72).
13. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the power components (75) are power MOSFETs (79).

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14. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the power components (75) are arranged symmetrically for better heat dissipation on the first substrate (71).
15. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the two substrates (71, 72) are heat sinks, wherein at least one extension (97) of the punched grid (44) is a cooling surface (96) outside the plastic body (95).
16. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the plastic body (95) is formed on by means of a transfer molding process, wherein epoxy molding compound flows into a gap (113) between the two substrates (71, 72).
17. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the plastic body (95) is extrusion coated with another plastic of a housing part (14) and/or of a connector collar (111).
18. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the plastic body (95) is arranged on a separate module support, and fixed by means of a clip connection.
19. (Previously Presented) Electric motor (10) according to Claim 1, characterized in that the electronic unit (70) can be mounted radially to an armature shaft (12) and arranged directly opposite from a commutator (36) and/or a position transmitter (62, 64) of the armature shaft (12), and the plastic body (95) features a formation (107) for adapting to the motor geometry.

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20. (Currently Amended) Electronic module (70) in a sandwich construction, comprising a first electrically conductive substrate (71) and a second electric conductive substrate (72), between which power components (75) are located and electrically connected to both substrates (71, 72), and a side (84) of the second substrate (72) facing away from the first substrate (71) is equipped with additional electronic components (56), wherein the first substrate (71) is a punched grid (44) punched from a metal material, which together with the second substrate (72) is extrusion coated with and encapsulated by a plastic body (95) produced by injection molding, in such a way that the extensions (97) of the punched grid (44) protrude from the plastic body (95), forming an electrical and/or mechanical interface (98) for connecting additional motor components (99, 38, 40, 104, 102, 80).

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21. (Withdrawn) Method to produce an electric motor (10) with an electronic control unit (70), characterized by the following steps:
- a one-piece conductive punched grid (71, 44) is punched out, wherein a dam bar (93) connects the individual segments (73) with one another;
 - pre-soldered power components (75) on the punched grid (44) and above it a ceramic substrate (72, 81) with additional components (56), located on a side (84) of the second substrate (72) facing away from the punched grip (71), are coated into a sandwich;
 - the individual layers (71, 75, 72) are electrically connected with one another by means of joining methods;
 - using a transfer molding process, a module body (95) of plastic is sprayed on around the sandwich (70) in such way that the dam bar (93) is arranged outside the module body (95); and
 - the dam bar (93) is separated and the extensions (97) of the punched grid (44) that protrude from the module body (95) are electrically and/or mechanically connected to motor components (99), or to external electrical components (74).
22. (Withdrawn) Method according to Claim 21, characterized in that a magnetic position sensor (60) is arranged on the ceramic substrate (72) and extrusion coated with plastic (95) in such a way that, after assembly of the control unit (70), the position sensor (60) is arranged directly opposite from a magnetic position transmitter (62, 64) arranged on a armature shaft (12) of the electric motor (10) and cooperates with said position transmitter.
23. (New) Electric motor (10) according to Claim 1, characterized in that the punched grid (44) is formed from a copper sheet by means of punching, bending and embossing.
24. (New) Electric motor (10) according to Claim 1, characterized in that the plastic molding compound of the plastic body (95) is arranged in gaps (113) and voids (113) between the substrates (71, 72) and the power components (75).